

XXXIII CONGRESSO NAZIONALE AIRO

# AIRO2023

BOLOGNA,  
27-29 OTTOBRE 2023

PALAZZO DEI CONGRESSI

Radioterapia Oncologica: l'evoluzione al servizio dei pazienti



Associazione Italiana  
Radioterapia e Oncologia clinica

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## **Theragnostic utilities for neoplastic diseases of the rectum by MRI- guided radiotherapy (THUNDER 2) phase II trial: interim safety analysis**

Giuditta Chiloiro

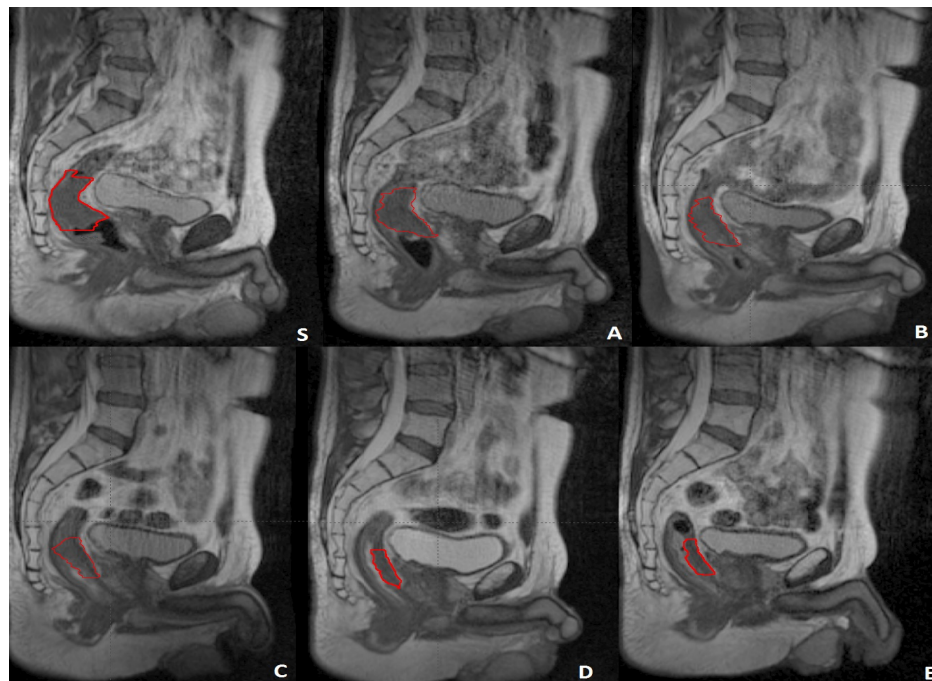
*Fondazione Policlinico Universitario "A. Gemelli" IRCCS, Roma*



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## MRgRT delta radiomics

- 16 patients, Long Course MRI-guided Radiochemotherapy
- 6 MRI per patient acquired @ 0.35T (T2\*/T1 weighted)
- Statistical, morphological and textural features
- Clinical Complete Response Prediction



*Boldrini et al. Rad Med, 2019*

# Implementing multidimensional models



Original article

A TCP-based early regression index predicts the pathological response in neo-adjuvant radio-chemotherapy of rectal cancer

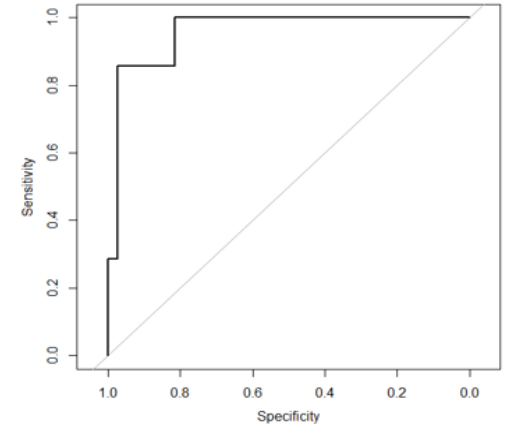
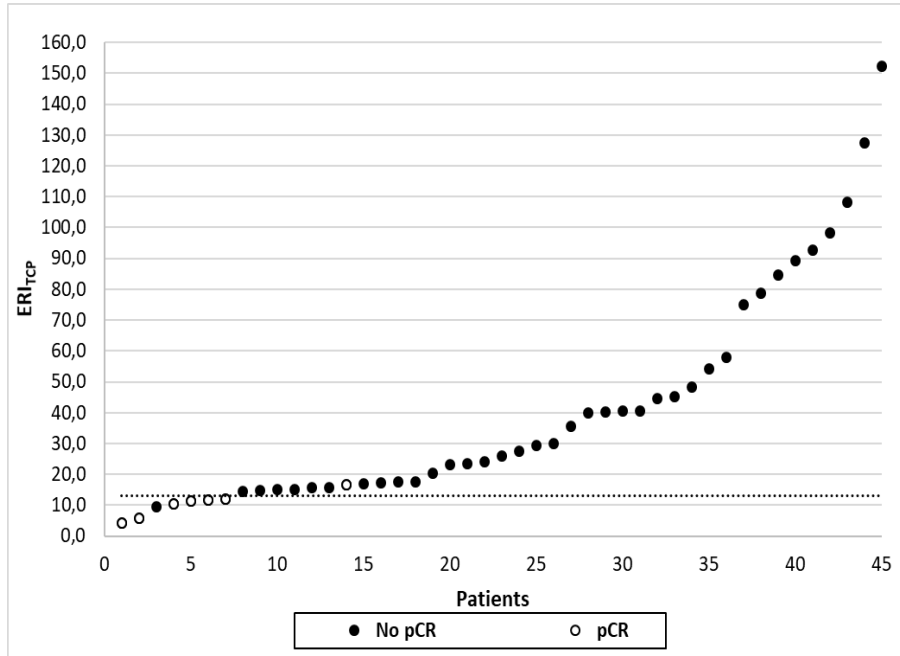
Claudio Fiorino<sup>a,\*</sup>, Calogero Gumina<sup>b</sup>, Paolo Passoni<sup>b</sup>, Anna Palmisano<sup>c</sup>, Sara Broggi<sup>a</sup>, Giovanni M. Cattaneo<sup>a</sup>, Alessandra Di Chiara<sup>c</sup>, Antonio Esposito<sup>c</sup>, Martina Mori<sup>a</sup>, Roberta Raso<sup>a</sup>, Monica Ronzoni<sup>d</sup>, Riccardo Rosati<sup>e</sup>, Najla Slim<sup>b</sup>, Francesco De Cobelli<sup>c</sup>, Riccardo Calandrino<sup>a</sup>, Nadia G. Di Muzio<sup>b</sup>

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$$ERI = -\ln \left[ 1 - \left( \frac{V_{mid}}{V_{pre}} \right)^{V_{pre}} \right]$$

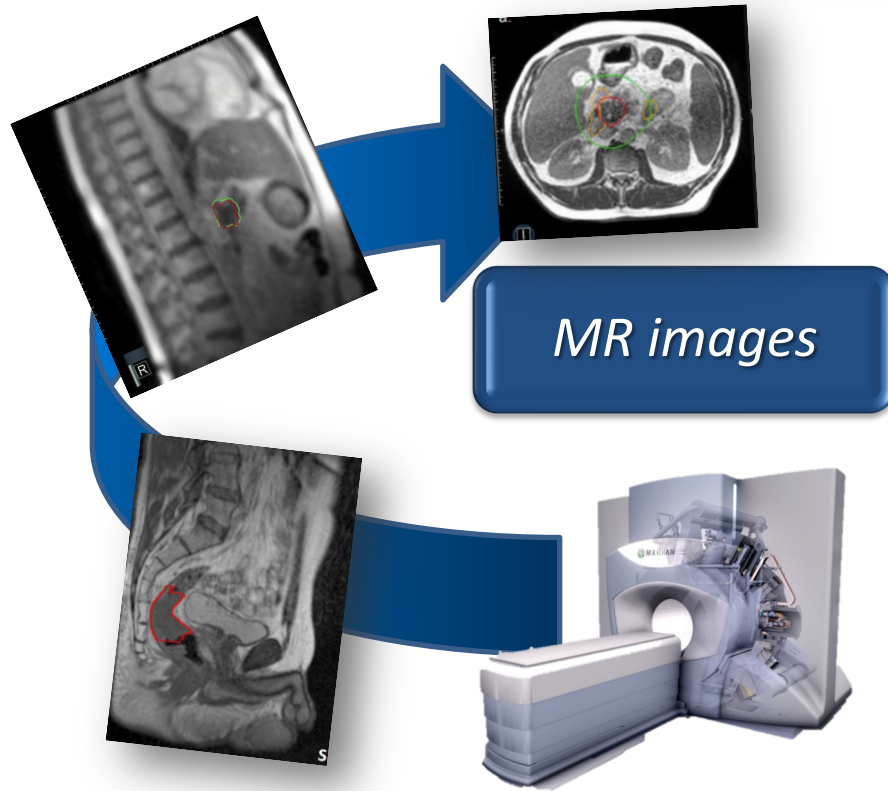
**ERI values < 13.1 predicts pCR with an AUC of ROC curve = 0.81**

43 LARC patients were retrospectively enrolled (7 pCR, 16.2%)



**AUC = 0.95**  
**Sensitivity = 0.86**  
**Specificity = 0.97**  
**Accuracy = 0.95**

*Cusumano et al IJROBP 2020*



## Why MR images?

- To see better
- To gate better
- To adapt better



Treatment personalization

## Thunder 2: aims

- Increasing of **10%** of **CR** rate in “*not responder*” rectal cancer patients treated with MRI-LINAC hybrid machine

*Chiloiro G. et al, BMC 2022*

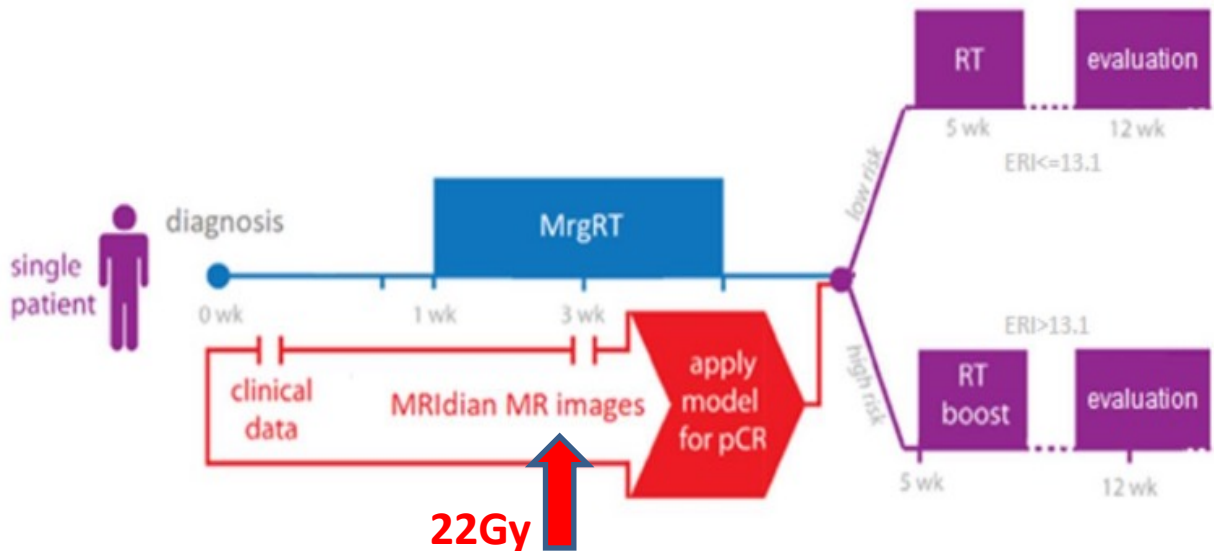
## Thunder 2: inclusion criteria

- Histological proven adenocarcinoma of the rectum
- **cT2-3, N0-2 or cT4 for anal sphincter involvement N0-2a, M0**
- No prior radiotherapy in pelvic region;
- Tumour located between 0 and 15 cm above the anal verge;
- **Not mesorectal fascia involvement for tumor**
- **No extramesorectal nodes involvement**
- **No extramural venous invasion (EMVI)**
- **No rectal mucinous adenocarcinoma histology**
- No contra-indications for MRI
- ECOG 0-1
- Age over 18 years

*Chiloiro G. et al, BMC 2022*



## Thunder 2: study design



High probability  
pCR  
ERI ≤ 13.1

**Standard RT-CT**  
55Gy on T+  
corresponding  
mesorectum

Low probability  
pCR  
ERI > 13.1

**Boost 60.1 Gy**  
recontoured GTV  
primary + 3 mm  
margin

CT with 5-FU or oral capecitabine (5-FU 225 mg/mq/day in c.i.; Capecitabine 1650 mg/m2/day chronomodulated)

Chiloiro G. et al, BMC 2022

## Thunder 2 interim analysis: aims

Assessment of **feasibility** and **safety** in terms of acute toxicity

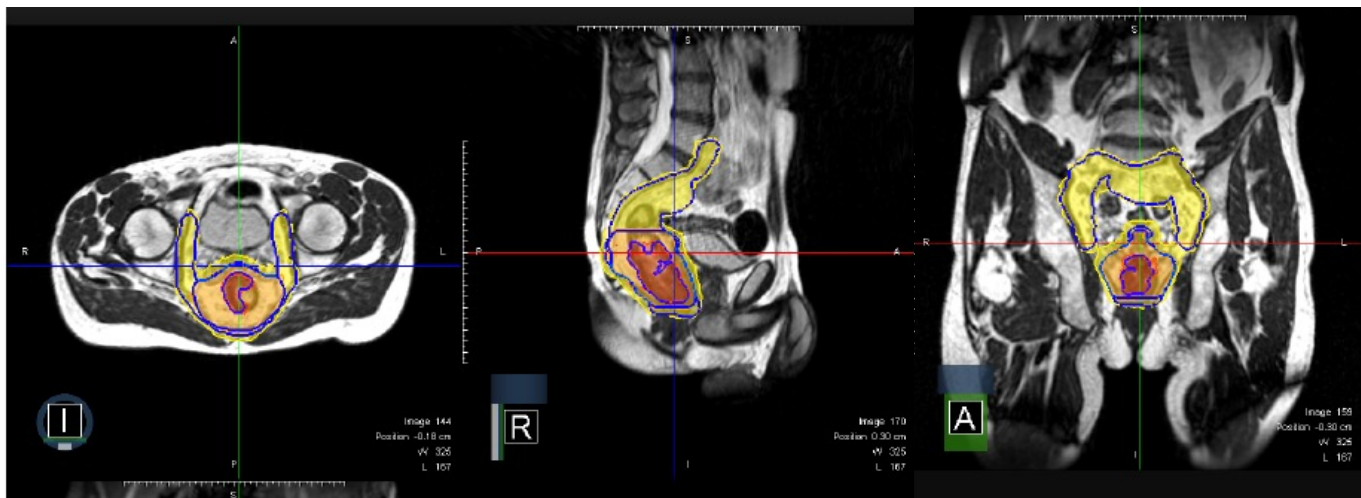
*Chiloiro G. et al, Radiation Oncology 2023*

## Materials and methods: acute toxicity

- Gastrointestinal: Proctitis, diarrhoea, tenesmus, mucorrhoea
- Urogenital: cystitis
- Fatigue
- Haematological toxicities: anaemia, leukopenia, thrombocytopenia

*Assessed approximately every 7 RT fractions and 45 days after completing nCRT CTCAE version 5.0 scale*

## Results



**32 patients enrolled, 16 boost (50%)**

Out of a total of 800 delivered fractions, 209 (26.3%) were delivered with online adaptive mode

*Chiloiro G. et al, Radiation Oncology 2023*

## Results

Patients characteristics	Number
	<b>32 (100%)</b>
<b>Median Age years (range)</b>	<b>67 (41-94)</b>
<b>Gender</b>	
<b>Male</b>	18 (56.3)
<b>Female</b>	14 (43.7)
<b>ECOG</b>	
<b>0</b>	26 (81.3)
<b>1</b>	6 (18.7)
<b>Tumor location</b>	
<b>High</b>	2 (6.3)
<b>Middle</b>	11 (34.4)
<b>Low</b>	19 (59.3)
<b>cT stage</b>	
<b>2</b>	4 (12.5)
<b>3</b>	26 (81.3)
<b>4</b>	2 (6.2)
<b>cN stage</b>	
<b>0</b>	9 (28.1)
<b>1</b>	16 (50)
<b>2</b>	7 (21.93)

Chiloiro G. et al, Radiation Oncology 2023

## Results

32 Patients	Toxicity (CTCAE v 5.0)				*p value
	G1	G2	G3	Total	
	22 (68.8)	7 (21.9)	<b>1 (3.2)</b>	30 (93.8)	
<b>16 boost</b>	11 (34.4)	4 (12.5)	0	15 (46.9)	<b>0.54</b>
<b>16 no boost</b>	11 (34.4)	3 (9.4)	<b>1 (3.2)</b>	16 (50)	
<b>Proctitis</b>	7 (21.9)	1 (3.2)	1 (3.2)	9 (28.1)	
<b>Diarrhoea</b>	12 (37.5)	2 (6.3)	1 (3.2)	15 (46.9)	
<b>Tenesmus</b>	13 (40.7)	1 (3.2)		14 (43.9)	
<b>Mucorrhoea</b>	15 (46.9)	3 (9.4)		18 (56.3)	
<b>Cystitis</b>	8 (25)		1 (3.2)	9 (28.1)	
<b>Fatigue</b>	7 (21.9)	1 (3.2)		8 (25)	

*No hematological toxicity were reported*

Chiloiro G. et al, Radiation Oncology 2023

## Results

- CRT treatment was discontinued in 5 (15.6%) patients for a median of 2 days (range 1-13)
  - 2 cases: Linac failure
  - 1 case: G3 toxicity
  - 1 case: onset of fever which resolved spontaneously in 1 case
  - 1 case: logistic issue
- CHT was discontinued in 2 other patients (overall 7 (21.9%))
  - hand-foot syndrome

*Chiloiro G. et al, Radiation Oncology 2023*

## Conclusions

MRIgRT dose escalation in LARC:

**Feasible and Safe** in terms of acute toxicity

... we are waiting for the end of enrolment for the results